* NOTICES *

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CLAIMS

[Claim(s)]
A method characterized by comprising the following of operating the radio frequency discernment (RFID) tag 100 which has a tank circuit (120) for transmitting and receiving 1. signal.
Said RFID tag has a memory (132) further, and is said method, A step which transmits a power signal to said RFID tag, and derives voltage in said tank circuit by it
At least one transistor [in / including a step which detects the 1st source voltage level / in said 1st source voltage level / said RFID tag] is a thing at the time of beginning to be switched exactly, Said method is further. A step modulated in a mode showing data stored in said RFID tag in Q value of said tank circuit in order to transmit data effectively in the case of detection of said 1st source voltage level
A step which detects the 2nd larger source voltage level than said 1st source voltage level.
A step which enables write operation to the 1st portion of said memory in the case of detection of said 2nd source voltage level.

2. Method according to claim 1 of containing further step which generates said power supply voltage by rectifying said power signal and charging capacitor.
3. Way according to claim 1 step which receives data for storing in said memory is included further, and said data contains error detection bit.
4. Method according to claim 1 of containing further step which repeats said step which modulates said Q value in order to broadcast said data again effectively.
5. Method according to claim 1 of containing further step which detects the 3rd source voltage level, and step which enables the 2nd reading and writing of portion of said memory.
6. Method according to claim 5 of containing further step which enables reading and writing of password which are stored in said RFID tag when said 3rd source voltage level is detected.
7. Method according to claim 6 of containing further step which enables reading and writing

of write-locking bit when said 3rd source voltage level is detected.
A method characterized by comprising the following of operating 8. radio frequency discernment (RFID) tag.
A step which receives a power signal on a radio frequency subcarrier transmitted to said RFID tag.
A step which generates service voltage from a received power signal.
A step which will detect this if said service voltage reaches the 1st voltage level is included, Said 1st voltage level is a thing at the time of at least one transistor in said RFID tag beginning to be switched exactly, and said method is further. A step which enables the 1st memory reading operation in the case of detection of said 1st voltage level
A step which transmits read data, a step which will detect this if said service voltage reaches the 2nd larger voltage level than said 1st voltage level, answers this, and enables memory write operation, A step which reads a password which will detect this if said service voltage reaches the 3rd larger voltage level than said 2nd voltage level, answers this, enables the 2nd memory reading operation, and is stored in said RFID tag.

9. Method according to claim 8 of containing further step which answers detection of said 3rd voltage level, enables memory write operation, and is written in said password.
10. A way according to claim 8 said step which transmits contains a step which modulates a loading resistor of a tank circuit.
11. A method according to claim 10 of containing further a step which repeats said step which modulates said loading resistor in order to broadcast read data again.
12. A method according to claim 11 of said step which generates service voltage rectifying a received power signal, and containing a step which charges a capacitor.
13. Provide a protected memory area and a memory area which is not protected, and a step which stores a password in said protected memory area is included further, A method according to claim 8 by which said 1st memory reading operation is turned to said memory area which is not protected, and said 2nd memory reading operation is turned to said protected memory area.
14. A method according to claim 13 of containing further a step which enables memory write operation which answers detection of said 3rd voltage level and is turned to said protected memory area, and a step which stores a write-locking bit in said protected memory area.
15. radio frequency discernment (RFID) tag comprising:
The 1st enabling means for bringing about the 1st enable signal (133A).
The 2nd enabling means for bringing about the 2nd enable signal (133B).
A tank circuit (120) containing load.
A means (124) for modulating said load so that Q value of said tank circuit may be changed, A means (134) for writing in data into a means (134) for reading data contained in inside

16. A means for generating service voltage is included further, and it is said 1st enable signal.
It is shown that ********** reached the 1st voltage level and it is said 2nd enable signal.
The RFID tag according to claim 15 in which it is shown that ****** service voltage reached the 2nd larger voltage level than said 1st voltage level.
17. The RFID tag according to claim 16 which the trigger of said protection instrument will be carried out including an input overvoltage protector further if said RFID tag reaches said 2nd voltage level, and is combined so that said means for writing in said protection instrument may be enabled.
18. The RFID tag according to claim 15 which contains further the 3rd enabling means for bringing about the 3rd enable signal, and the 2nd means for performing reading and writing to memory storage enabled by said 3rd enabling means.
19. The 2nd means for performing the aforementioned reading and writing is reading and the RFID tag according to claim 18 combined so that it may write in about said password, including a password further.
20. The 2nd means for performing the aforementioned reading and writing is reading and the RFID tag according to claim 19 combined so that it may write in about said write-locking bit, including a write-locking bit further.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
Technical field of a minimum voltage radio frequency discernment invention This invention generally relates to far-reaching RFID access more specifically about a radio frequency discernment ("RFID") device.
Background art A remote electronic identification unit consists of the transponder and interrogator unit which separate distantly typically and are arranged. It depends for the working range of such a device on the architecture which makes the foundation of a transponder unit. U.S. Pat. No. 4,333,072 to bagel (Beigel)
For example, a remote discrimination system consists of a probe circuit (interrogator) which approaches an implant circuit (transponder) very much and operates. If a probe circuit is brought close to the implant, electric power will be supplied, and an implant circuit generates voltage by derivation covering the coil of the implant. The information from the implant is transmitted to a probe by changing the inductive load on the coil of the implant and detecting such change in a probe. It is necessary to put a probe on a very near interval from the implant, therefore the working range of such a device is substantially restricted in this operational mode.
In other remote discrimination systems, in order to bring about a communication link between an interrogator and a transponder, radio frequency signal communication is used. In these radio frequency discernment (RFID) devices of a certain class, an RF signal includes the power signal transmitted to a transponder device. This power signal
The power supply capacitor in ** and the transponder which plays a role of a power supply of a transponder is charged.
Generating and transmission of RF energy are concerned with transmission of the data from a transponder. The power supply capacitor must be a thing of sufficient size to bring about electric power sufficient for such transmission. In such a transponder, the reading distance of 2-meter order becomes possible. However, this type of transponder is not practical in the application which needs small sizes, such as discernment of the livestock by the hypodermic embedding of a device, for example.

In RFID of the 3rd category, the feature from two above-mentioned designs is together put by another approach. An interrogator transmits an RF signal including a power signal. It is not enough to generate the radio signal of itself although the voltage derived over a transponder coil by the received power signal is enough to operate a transponder circuit. Since a capacitor is combined with a coil and parallel, a tank circuit is formed, and Q of a tank circuit is changed by changing the resistance or the capacitive load crossed to a tank circuit. Tuning of a tank circuit changes from this, change arises in the signal reflected as a result, and an interrogator can detect this. Thus, the transponder can transmit the data to an interrogator by responding, only modulating a resistance load and enabling it to detect the change in the signal with which the interrogator was reflected.
This method has an advantage to two above-mentioned designs. The signal reflected in the first place
It is detectable covering the distance of about 1 meter of **. For this reason, an interrogator does not need to approach a transponder very much like [in the case of the device of bagel], and it is not necessary to operate. Since the power signal transmitted to the second is not stored in a transponder, it is not required and the smaller factor package of a big power supply capacitor is attained.
Typically, RFID includes the power on reset circuit which prevents operation of a device until it reaches a level with the voltage level of a device including the nonvolatile memory which can be written in.
In order to guarantee reliable data transmission, setting the level of a reset circuit as the record level for operating nonvolatile memory is carried out. Since reset voltage is quite higher than voltage actually required to operate a memory, the reading range can be artificially restricted by this.
It is bringing about the performance which is equal to the RFID device which increases the working range of the RFID device of this 3rd category, and uses a power supply capacitor as an improvement. For this reason, the RFID device which brings about the compact package outline which becomes possible and is characterized by long-distance read capability is required by removing a power supply capacitor.
The invention of ****** of an invention indicates the device for the method of operating a radio frequency discernment (RFID) tag, and such a method. A method contains the step which detects the 1st voltage level in a RFID tag, and the step which answers such detection and transmits data from a tag. The 2nd voltage level is detected, such detection is answered, and the occurring write operation to the memory of a RFID tag is enabled. The 3rd voltage level is detected and the write permission to a specific protection location with a memory is enabled in this case.
The RFID tag by this invention is radio frequency (RF) by a remote interrogator unit.
The tank circuit for receiving the power signal transmitted on a subcarrier is included. The bridged circuit in a RFID tag rectifies a power signal, and charges a memory capacitor. A memory capacitor supplies sufficient energy (V_{dd}) to make possible reading of nonvolatile

storages (for example, EEPROM, a flash plate, etc.), and operate a modulation circuit, and modulate a resistance load over a tank circuit. Information is given to an interrogator from a tag by changing a resistance load as a function of the data read from a memory.
Then, the corresponding change in the reflected signal is detected by an interrogator.
The 1st voltage-level detector circuit brings about the enable signal which enables reading of a memory and operation of a modulator. The 1st level detector will be set up enable reading of a memory immediately if there is sufficient voltage for a read circuit and a modulation circuit to switch. The working range of a RFID tag is increased by enabling transmission of data to happen at an early stage as much as possible by this. The data which operating on voltage lower than a memory also damaged from some reading operation for a certain reason may produce logic. However, data becomes exact as voltage continues rising exceeding the minimum operating voltage of memory storage. Since the error detection code is contained in the data stored in a RFID tag, the error data which reaches an interrogator can be detected and disregarded.
The 2nd voltage-level detector circuit enables the write operation to almost all the fields of a memory. The voltage level detected by the 2nd level detector is larger than the voltage level detected by the 1st level detector. The error detection bit which should be written in with data is contained in the data which is transmitted by the machine between quality and which should be written in. For this reason, it becomes certain when the accuracy of data is reading of subsequent data.
A memory contains a certain protected portion including information, including a password, a write-locking bit, etc. The 3rd voltage-level detector circuit enables the writing to the protection location of a memory. The voltage level detected by the 3rd level detector is larger than the voltage level detected by the 2nd level detector. The voltage detected by the 3rd level detector in a desirable example is the same as it of an overvoltage protection circuit. Thus, in order to carry out the trip of the excess voltage circuit with the voltage level more than a voltage level required to perform the writing to a memory, the write operation to the protection location of a memory is guaranteed.
The easy explanatory view 1 of a drawing shows the block diagram of the RFID tag by this invention.
Drawing 2 is a block diagram of the low voltage detection circuit of this invention.
With reference to best gestalt drawing 1 for carrying out this invention, the radio frequency discernment (RFID) system 100 contains the interrogator unit 102 and the transducer unit (tag) 104. The interrogator 102 contains the transmission coil 103 for transmitting an RF signal to the tag 104.
As for the tag 104, this forms the tank circuit 120 with capacitor C_t including pick-up-coil L_t.
It migrates to a tank circuit and the voltage clamp 122, the load modulation circuit 124, and the full wave bridge rectification circuit 126 are combined. The voltage clamp 122 is an overvoltage protector which restricts the maximum voltage which progresses over the tank circuit 120. In such a device, load is low, and Q of a tank circuit may increase especially the

voltage covering coil L_t even to a very high level, when high. Failure of a device may arise with such high voltage. If the voltage covering a coil approaches safe restriction of a device, the clamp 122 will reduce voltage by becoming one and increasing the current covering a clamp.

The modulation circuit 124 changes the load crossed to a tank circuit, and this changes the Q value of a tank circuit. A modulation circuit changes Q of a tank circuit according to the data which should operate under control of the controller 134 and should tell the interrogator 102. Detection of a change corresponding in the signal with which the interrogator was reflected "will transmit" data.

The bridge rectifier circuit 126 charges small capacitor C_f, and brings about power-supply-voltage V_{dd}. Electric power is given to the nonvolatile memory 132 with power supply voltage, and this contains the voltage pump and brings about programming voltage V_{pp}. The clock generator 136 is combined over the terminal of coil L_t. A clock generator is a differential comparator which extracts a clock from the signal received with the tag 104 substantially.

The memory 132 is 256-bit EEPROM and consists of eight 32-bit pages. The page 0 is constituted as what added eight write-locking bits to 24 bit data. The page 1-7 is a user page. It is defined whether the write-locking bit can write on a corresponding 32-bit page. Password protection is also possible. A password is stored in the user page 7. Reading and write access to the memory 132 are provided via the controller 134. The demodulator 138 restores to the data signal which carries out ingress, and supplies this to the controller 134. A data signal includes the sequence of a command bit, and the arbitrary sequences of the data bit which continues after that.

The low voltage detection circuit 130 brings about the enable signal 131, and it enables the specific operation set to various voltage levels as a device upgrades. The block diagram of the low-voltage block 130 by this invention is shown in drawing 2. A voltage standard descends over the "resistor chain" which consists of resistor R1-R3.

With the rough figure of drawing 2, in order to explain clearly, the circuit using a resistor is shown. However, it is understood that a "resistor chain" consists of a circuit containing N channel transistor of a series connection generally used. A resistor chain plays a role of a multi-node voltage divider supplied to a series of comparator 133A-133C.

Typically, a voltage reference circuit is set as the value of the band gap voltage of the bipolar transistor which is 1.2V, and brings about a voltage standard unrelated to power supply voltage, temperature, and a process variation. Such a circuit is common knowledge in the art concerned, is understood, and may use any of much publicly known designs. The 2nd resistor chain containing R4 and R5 divides power-supply-voltage V_{dd}.

Each comparator compares the divided power supply voltage with the voltage in each node A-C in a resistor chain. Then, if divided V_{dd} reaches V_A, the 1st enable signal 131A will be

brought about, V_A is a voltage drop covering the resistor R1, and this is calculated from the equation of the following voltage dividers.

$$V_A = V_{ref}\left(\frac{R_1}{R_1 + R_2 + R_3}\right) \qquad \text{式 1}$$

Similarly, the 2nd enable signal 131B will be brought about if divided V_{dd} reaches V_B, and V_B is defined as follows.

$$V_B = V_{ref}\left(\frac{R_1 + R_2}{R_1 + R_2 + R_3}\right) \qquad \text{式 2}$$

Finally, the 3rd enable signal 131C arises based on the voltage in the node C which is the voltage standard itself simply. That is, if divided V_{dd} reaches V_{ref}, the signal 131C will be asserted.

Again with reference to drawing 1, the low-voltage-detection machine 130 supplies these enable signals to the controller 134. "transmitting" [data] If the 1st enable signal 131A is asserted, a controller will begin to read the contents of the memory 132 and will begin them by modulating the load of the tank circuit 120. The resistor R1 is chosen so that voltage drop V_A covering this may be the thing that the transistor which constitutes the controller 134 begins to be switched exactly. Thus, the reading operation by the interrogator 102 can be started in the furthest possible distance from the transponder 104, and the working range of a transponder spreads effectively by this.

The 2nd enable signal 131B of the low-voltage-detection machine 130 enables the controller 134, and makes possible write operation to the field where the protective measures of the memory 132 are not made. The user page 1-6 is contained in this, and the page 7 is also contained in the case where password protection is not used. The write access to the page 0 (page 7 when [and] password protection is used) is not permitted.

The 3rd enable signal 131C of the low-voltage-detection machine 130 enables the controller 134, and makes possible reading and write operation to the protection location of the memory 132.

As mentioned above, the page 0 contains the write-locking bit which defines the write access of each eight corresponding 32-bit pages. Once a page is locked, it cannot write in this. The further security is provided in order to prevent unlocking such a page eternally. For this reason, it is important to ensure that the writing of a lock bit is exact. This is attained by setting the voltage level corresponding to the 3rd enable signal as the voltage level of the overvoltage protection circuit 122. By doing so, in order that the voltage pump of the memory 132 may generate the highest possible programming voltage, having available maximum safety voltage is guaranteed. A possibility that the mistaken lockout which may be made into what it becomes easy reliable to write in of a lock bit, therefore is not helpful in a device by this and which is a page will take place is made into the minimum.

Please recollect that reading of the field where a memory is not protected will start shortly after the controller 134 begins to operate. In the state of such a low voltage, it may lead to receiving the data in which experienced the error when reading a memory accidentally and transmitting data to/or an interrogator, and the interrogator was transmitted accidentally as a result. According to this invention, the data stored in the memory 132 contains an error detection bit. An error bit is calculated by the interrogator 102 and stored in the transponder 104 with data. Therefore, the damaged data received by the interrogator is detectable by comparing with the error bit which the error bit of the received data was calculated [error bit] and had this received. In order that a controller may broadcast data again continuously in this invention (an interrogator is in an extreme working range.),
Therefore, even if the state of the low voltage is prolonged, the probability that right data will arise from subsequent retransmission of message is high.

[Translation done.]

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DRAWINGS

[Drawing 1]

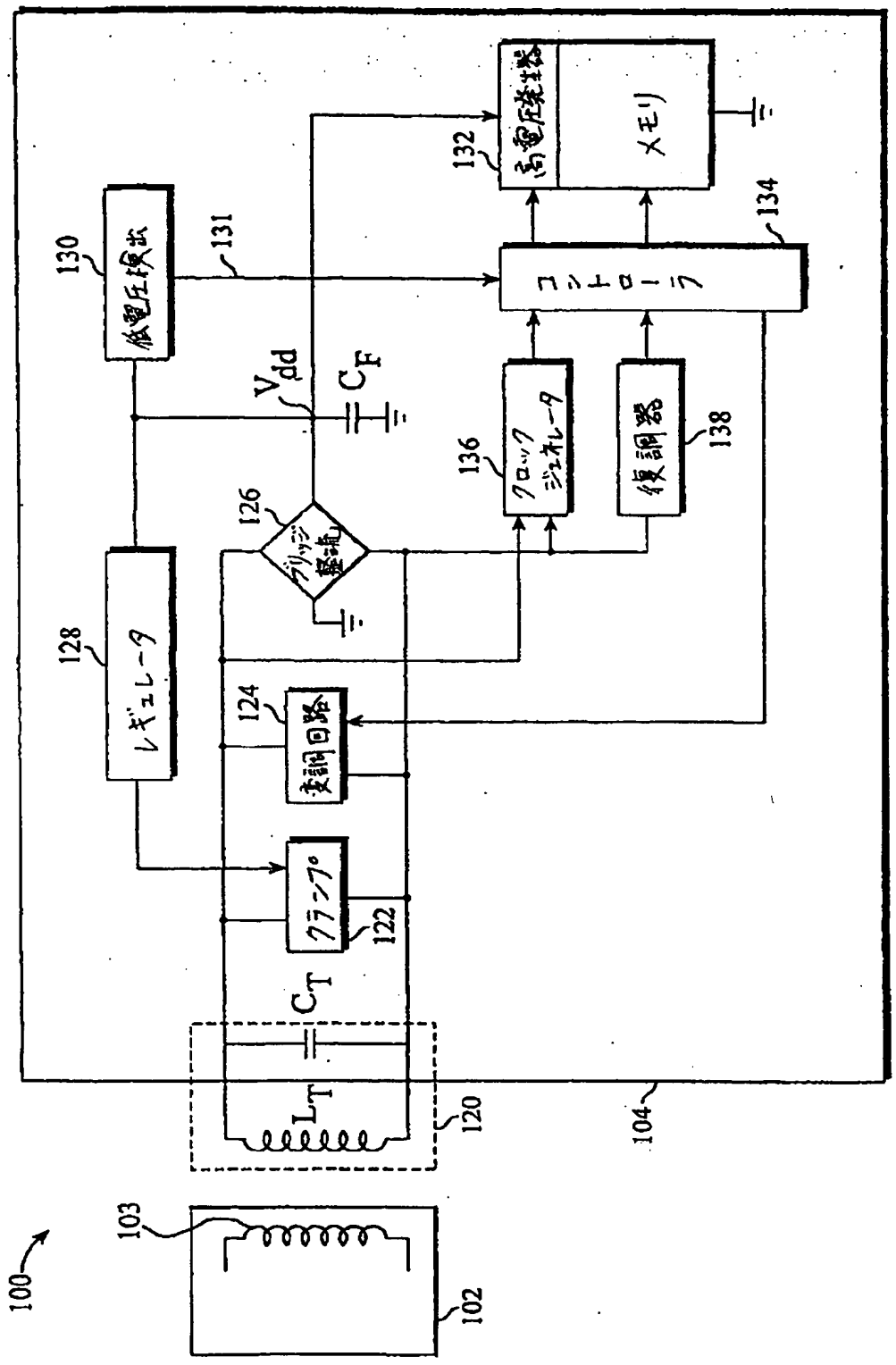

Fig. 1

[Drawing 2]

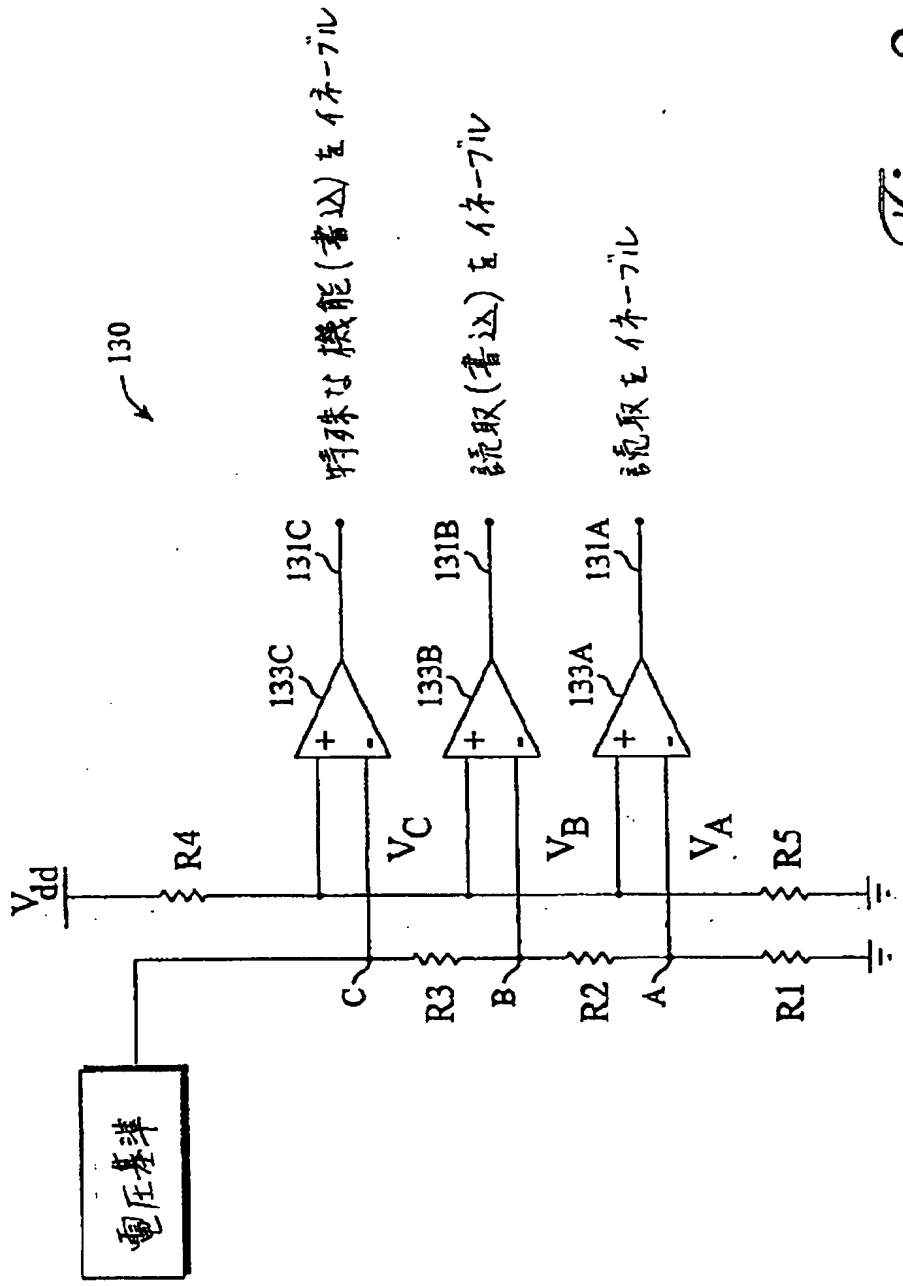

Fig. 2

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WRITTEN AMENDMENT

[Written amendment] The 4 4th paragraph of Article 184 of Patent Law
[Filing date]April 7 (1999.4.7), Heisei 11
[Proposed Amendment]
CLAIMS
1. Radio frequency discernment (RF) which has tank circuit (120) for transmitting and receiving signal
ID) It is how to operate the tag 100 and said RFID tag is a memory further.
It has (132) and is said method,
A power signal is transmitted to said RFID tag, and it is said tank circuit smell by it.
The step which derives ******,
The step which detects the 1st source voltage level is included, and it is said 1st power-supply-voltage REBE.
At least one transistor in said RFID tag switches RU exactly.
It is a thing in the ********** case and said method is further.
In order to answer detection of said 1st source voltage level and to transmit data effectively
Voice showing the data which is alike and is stored in said RFID tag in the Q value of said tank circuit
The step which and is modulated,
SUTETSU which detects the 2nd larger source voltage level than said 1st source voltage level
PU,
Detection of said 2nd source voltage level is answered, and it is the writing to the 1st portion of said memory.
A method containing the step which enables ******.
2. It is said power supply voltage by rectifying said power signal and charging a capacitor.
The method according to claim 1 of containing the step to generate further.
3. Before step which receives data for storing in said memory is included further
The way according to claim 1 account data contains an error detection bit.

4. Said step which modulates said Q value in order to broadcast said data again effectively
The method according to claim 1 of containing the step to repeat further.
5. ** of step which detects the 3rd source voltage level, and the 2nd portion of said memory

The method according to claim 1 of containing further the step which enables ** and writing
.
6. When said 3rd source voltage level is detected, it is stored in said RFID tag.
Claim 5 which contains further the step which enables reading and the writing of a password
It is alike and is the method of a statement.
7. When said 3rd source voltage level is detected, it is reading and the writing of a write-locking bit.
The method according to claim 6 of containing further the step which enables **.
8. It is how to operate a radio frequency discernment (RFID) tag,
SUTE which receives the power signal on the radio frequency subcarrier transmitted to said RFID tag
PPU,
The step which generates service voltage from the received power signal,
It is an implication about the step which will detect this if said service voltage reaches the 1st voltage level.
Said 1st voltage level is at least one transistor in said RFID tag.
It is a thing in the goose ********** case, and said method is further.
Detection of said 1st voltage level is answered and it is enabling ** about the 1st memory reading operation.
** step,
The step which transmits the read data,
If said service voltage reaches the 2nd larger voltage level than said 1st voltage level
The step which detects this, answers this and enables memory write operation,
If said service voltage reaches the 3rd larger voltage level than said 2nd voltage level
This is detected, this is answered, the 2nd memory reading operation is enabled, and it is said R.
A method containing the step which reads the password stored in a FID tag.
9. Before answering detection of said 3rd voltage level and enabling memory write operation
The method according to claim 8 of containing the step written in an account password further.
10. The step to which said step which transmits modulates the loading resistor of a tank circuit
The included method according to claim 8.
11. Said SUTETSU which modulates said loading resistor in order to broadcast the read

data again
The method according to claim 10 of containing further the step which repeats PU.
12. Said step which generates service voltage rectifies the received power signal, and is Capa.
The method according to claim 11 containing the step which charges SHITA.
13. The protected memory area and the memory area which is not protected are provided, and the aforementioned protection is carried out.
The step which stores a password in a ** memory area is included further, and it is said 1st memo.
The Li reading operation is turned to said memory area which is not protected, and it is said 2nd memory **.
The method according to claim 8 by which ****** is turned to said protected memory area.
14. Answer detection of said 3rd voltage level and turn to said protected memory area.
The step which enables ****** memory write operation, and said protected memory area
It is a statement to claim 13 which contains further the step which is alike and stores a write-locking bit.
Method.
15. It is a radio frequency discernment (RFID) tag,
The 1st enabling means (133A) for bringing about the 1st enable signal
**
The 2nd enabling means (133B) for bringing about the 2nd enable signal
**
The tank circuit (120) containing load,
The means (1) for modulating said load so that the Q value of said tank circuit may be changed
24),
In order to write in data into the means (134) for reading the data contained in inside
The memory array (132) which has ****** (134) is included,
Said means for reading answers the data read from said memory array,
said means for becoming irregular so that said Q value of said tank circuit may be changed -- combination
**,
It is combined with said 1st enabling means, and said means for reading is this.
** enabling is carried out,
It is combined with said 2nd enabling means, and said means for writing in is this.
The RFID tag by which ** enabling is carried out.
16. The means for generating service voltage is included further, and it is said 1st enable signal.
It is shown that ********** reached the 1st voltage level and it is said 2nd enable signal.
****** service voltage reached the 2nd larger voltage level than said 1st voltage level.

The RFID tag according to claim 15 in which things are shown.
17. An input overvoltage protector is included further and, as for said protection instrument, said RFID tag is a front.
Said hand for a trigger being carried out if the 2nd voltage level of an account is reached, and writing in said protection instrument
The RFID tag according to claim 16 combined so that the stage may be enabled.
18. The 3rd enabling means for bringing about the 3rd enable signal, and said **
They are reading and writing to the memory storage enabled by the enabling means of 3.
The RFID tag according to claim 15 which contains the 2nd means for carrying out further.
19. The 2nd means for performing the aforementioned reading and writing, including a password further
It is a statement to reading and claim 18 combined so that it may write in about a ****** password.
RFID tag.
20. The 2nd for performing the aforementioned reading and writing, including a write-locking bit further
******s are reading and a claim combined so that it may write in about said write-locking bit.
A RFID tag given in 19.

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A power signal is transmitted to said RFID tag, and it is said tank circuit smell by it.
The step which derives ******,
The step which detects the 1st source voltage level is included, and it is said 1st power-supply-voltage REBE.
At least one transistor in said RFID tag switches RU exactly.
It is a thing in the ********** case and said method is further.
In order to answer detection of said 1st source voltage level and to transmit data effectively
Voice showing the data which is alike and is stored in said RFID tag in the Q value of said tank circuit
The step which and is modulated,
SUTETSU which detects the 2nd larger source voltage level than said 1st source voltage level
PU,
Detection of said 2nd source voltage level is answered, and it is the writing to the 1st portion of said memory.
A method containing the step which enables ******.
2. It is said power supply voltage by rectifying said power signal and charging a capacitor.
The method according to claim 1 of containing the step to generate further.
3. Before step which receives data for storing in said memory is included further
The way according to claim 1 account data contains an error detection bit.

4. Said step which modulates said Q value in order to broadcast said data again effectively
The method according to claim 1 of containing the step to repeat further.
5. ** of step which detects the 3rd source voltage level, and the 2nd portion of said memory

The method according to claim 1 of containing further the step which enables ** and writing
.
6. When said 3rd source voltage level is detected, it is stored in said RFID tag.
Claim 5 which contains further the step which enables reading and the writing of a password
It is alike and is the method of a statement.
7. When said 3rd source voltage level is detected, it is reading and the writing of a write-locking bit.
The method according to claim 6 of containing further the step which enables **.
8. It is how to operate a radio frequency discernment (RFID) tag,
SUTE which receives the power signal on the radio frequency subcarrier transmitted to said RFID tag
PPU,
The step which generates service voltage from the received power signal,
It is an implication about the step which will detect this if said service voltage reaches the 1st voltage level.
Said 1st voltage level is at least one transistor in said RFID tag.
It is a thing in the goose ********** case, and said method is further.
Detection of said 1st voltage level is answered and it is enabling ** about the 1st memory reading operation.
** step,
The step which transmits the read data,
If said service voltage reaches the 2nd larger voltage level than said 1st voltage level
The step which detects this, answers this and enables memory write operation,
If said service voltage reaches the 3rd larger voltage level than said 2nd voltage level
This is detected, this is answered, the 2nd memory reading operation is enabled, and it is said R.
A method containing the step which reads the password stored in a FID tag.
9. Before answering detection of said 3rd voltage level and enabling memory write operation
The method according to claim 8 of containing the step written in an account password further.
10. The step to which said step which transmits modulates the loading resistor of a tank circuit
The included method according to claim 8.
11. Said SUTETSU which modulates said loading resistor in order to broadcast the read

data again
The method according to claim 10 of containing further the step which repeats PU.
12. Said step which generates service voltage rectifies the received power signal, and is Capa.
The method according to claim 11 containing the step which charges SHITA.
13. The protected memory area and the memory area which is not protected are provided, and the aforementioned protection is carried out.
The step which stores a password in a ** memory area is included further, and it is said 1st memo.
The Li reading operation is turned to said memory area which is not protected, and it is said 2nd memory **.
The method according to claim 8 by which ****** is turned to said protected memory area.
14. Answer detection of said 3rd voltage level and turn to said protected memory area.
The step which enables ****** memory write operation, and said protected memory area
It is a statement to claim 13 which contains further the step which is alike and stores a write-locking bit.
Method.
15. It is a radio frequency discernment (RFID) tag,
The 1st enabling means (133A) for bringing about the 1st enable signal
**
The 2nd enabling means (133B) for bringing about the 2nd enable signal
**
The tank circuit (120) containing load,
The means (1) for modulating said load so that the Q value of said tank circuit may be changed
24),
In order to write in data into the means (134) for reading the data contained in inside
The memory array (132) which has ****** (134) is included,
Said means for reading answers the data read from said memory array,
said means for becoming irregular so that said Q value of said tank circuit may be changed -- combination
**,
It is combined with said 1st enabling means, and said means for reading is this.
** enabling is carried out,
It is combined with said 2nd enabling means, and said means for writing in is this.
The RFID tag by which ** enabling is carried out.
16. The means for generating service voltage is included further, and it is said 1st enable signal.
It is shown that ********** reached the 1st voltage level and it is said 2nd enable signal.
****** service voltage reached the 2nd larger voltage level than said 1st voltage level.

The RFID tag according to claim 15 in which things are shown.
17. An input overvoltage protector is included further and, as for said protection instrument, said RFID tag is a front.
Said hand for a trigger being carried out if the 2nd voltage level of an account is reached, and writing in said protection instrument
The RFID tag according to claim 16 combined so that the stage may be enabled.
18. The 3rd enabling means for bringing about the 3rd enable signal, and said **
They are reading and writing to the memory storage enabled by the enabling means of 3.
The RFID tag according to claim 15 which contains the 2nd means for carrying out further.
19. The 2nd means for performing the aforementioned reading and writing, including a password further
It is a statement to reading and claim 18 combined so that it may write in about a ****** password.
RFID tag.
20. The 2nd for performing the aforementioned reading and writing, including a write-locking bit further
******s are reading and a claim combined so that it may write in about said write-locking bit.
A RFID tag given in 19.

[Translation done.]

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(54)【発明の名称】　最小電圧無線周波識別

(57)【要約】
さまざまな電圧レベル（図２）においてさまざまな読取および書込動作を可能にする無線周波識別装置（ＲＦＩＤ）（１００、図１）が提供される。ある特定の読取動作は、ＲＦＩＤにおける電圧レベルが、回路が切換わるのに十分なものになるとすぐに可能になる。このような動作におけるエラーは再試行によって償われる。セキュリティに関連する動作はより高い電圧レベルを要し、このことでこのような動作におけるより高い信頼性を確実にする。

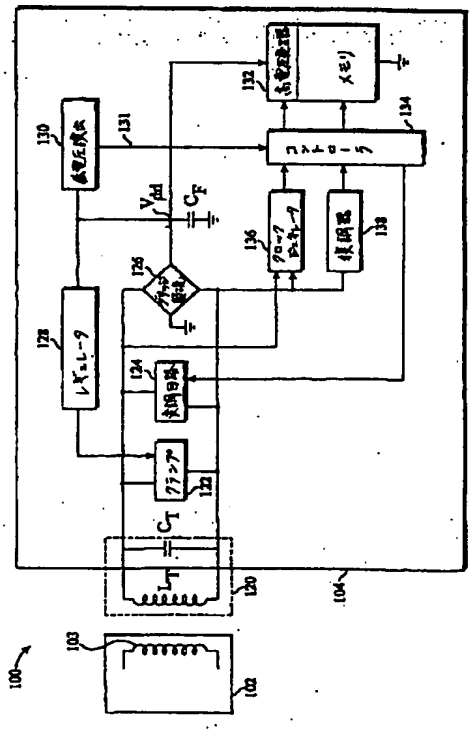

Fig. 1

【特許請求の範囲】

1．信号を送受信するためのタンク回路（１２０）を有する無線周波識別（ＲＦＩＤ）タグ１００を動作させる方法であって、前記ＲＦＩＤタグはさらにメモリ（１３２）を有し、前記方法は、

電力信号を前記ＲＦＩＤタグに送信して、それによって前記タンク回路において電圧を誘導するステップと、

第１の電源電圧レベルを検出するステップとを含み、前記第１の電源電圧レベルは前記ＲＦＩＤタグにおける少なくとも１つのトランジスタがちょうど切換えられ始める際のものであり、前記方法はさらに

前記第１の電源電圧レベルの検出の際に、効果的にデータを送信するために前記タンク回路のＱ値を、前記ＲＦＩＤタグにストアされるデータを表わす態様で変調するステップと、

前記第１の電源電圧レベルより大きい第２の電源電圧レベルを検出するステップと、

前記第２の電源電圧レベルの検出の際に、前記メモリの第１の部分への書込動作をイネーブルするステップとを含む、方法。

2．前記電力信号を整流してキャパシタを充電することによって前記電源電圧を発生するステップをさらに含む、請求項１に記載の方法。

3．前記メモリにストアするためのデータを受信するステップをさらに含み、前記データはエラー検出ビットを含む、請求項１に記載の方法。

4．前記データを効果的に再送信するために前記Ｑ値を変調する前記ステップを繰返すステップをさらに含む、請求項１に記載の方法。

5．第３の電源電圧レベルを検出するステップと、前記メモリの第２の部分の読取および書込をイネーブルするステップとをさらに含む、請求項１に記載の方法。

6．前記第３の電源電圧レベルを検出した際に前記ＲＦＩＤタグにストアされるパスワードの読取および書込をイネーブルするステップをさらに含む、請求項５に記載の方法。

7．前記第３の電源電圧レベルを検出した際に書込ロックビットの読取および書

込をイネーブルするステップをさらに含む、請求項６に記載の方法。

８．無線周波識別（ＲＦＩＤ）タグを動作させる方法であって、

前記ＲＦＩＤタグに送信される無線周波数搬送波上の電力信号を受信するステップと、

受信した電力信号から供給電圧を生成するステップと、

前記供給電圧が第１の電圧レベルに達するとこれを検出するステップとを含み、前記第１の電圧レベルは前記ＲＦＩＤタグ内の少なくとも１つのトランジスタがちょうど切換えられ始める際のものであり、前記方法はさらに

前記第１の電圧レベルの検出の際に第１のメモリ読取動作をイネーブルするステップと、

読まれたデータを送信するステップと、

前記供給電圧が前記第１の電圧レベルより大きい第２の電圧レベルに達するとこれを検出し、これに応答してメモリ書込動作をイネーブルするステップと、

前記供給電圧が前記第２の電圧レベルより大きい第３の電圧レベルに達するとこれを検出して、これに応答して第２のメモリ読取動作をイネーブルして前記ＲＦＩＤタグにストアされるパスワードを読むステップとを含む、方法。

９．前記第３の電圧レベルの検出に応答してメモリ書込動作をイネーブルして前記パスワードに書込むステップをさらに含む、請求項８に記載の方法。

１０．前記送信するステップは、タンク回路の負荷抵抗器を変調するステップを含む、請求項８に記載の方法。

１１．読まれたデータを再送信するために前記負荷抵抗器を変調する前記ステップを繰返すステップをさらに含む、請求項１０に記載の方法。

１２．供給電圧を生成する前記ステップは、受信した電力信号を整流し、キャパシタを充電するステップを含む、請求項１１に記載の方法。

１３．保護されたメモリ領域と保護されないメモリ領域とを設け、前記保護されたメモリ領域にパスワードをストアするステップをさらに含み、前記第１のメモリ読取動作が前記保護されていないメモリ領域に向けられ、前記第２のメモリ読取動作が前記保護されたメモリ領域に向けられる、請求項８に記載の方法。

１４．前記第３の電圧レベルの検出に応答して前記保護されたメモリ領域に向けられるメモリ書込動作をイネーブルするステップと、前記保護されたメモリ領域に書込ロックビットをストアするステップとをさらに含む、請求項１３に記載の方法。

１５．無線周波数識別（ＲＦＩＤ）タグであって、

第１のイネーブル信号をもたらすための第１のイネーブル手段（１３３Ａ）と、

第２のイネーブル信号をもたらすための第２のイネーブル手段（１３３Ｂ）と、

負荷を含むタンク回路（１２０）と、

前記タンク回路のＱ値を変化させるように前記負荷を変調するための手段（１２４）と、

中に含まれるデータを読取るための手段（１３４）と中へデータを書込むための手段（１３４）とを有するメモリアレイ（１３２）とを含み、

読取るための前記手段は、前記メモリアレイから読まれるデータに応答して、前記タンク回路の前記Ｑ値を変化させるように変調するための前記手段に結合され、

読取るための前記手段は前記第１のイネーブル手段に結合され、かつこれによりイネーブルされ、

書込むための前記手段は前記第２のイネーブル手段に結合され、かつこれによりイネーブルされる、ＲＦＩＤタグ。

１６．供給電圧を生成するための手段をさらに含み、前記第１のイネーブル信号は供給電圧が第１の電圧レベルに達したことを示し、前記第２のイネーブル信号は前記供給電圧が前記第１の電圧レベルよりも大きい第２の電圧レベルに達したことを示す、請求項１５に記載のＲＦＩＤタグ。

１７．入力過電圧保護装置をさらに含み、前記保護装置は前記ＲＦＩＤタグが前記第２の電圧レベルに達するとトリガされ、前記保護装置は書込むための前記手段をイネーブルするように結合される、請求項１６に記載のＲＦＩＤタグ。

１８．第３のイネーブル信号をもたらすための第３のイネーブル手段と、前記第３のイネーブル手段によりイネーブルされる記憶装置に対して読取および書込を行なうための第２の手段とをさらに含む、請求項１５に記載のＲＦＩＤタグ。

１９．パスワードをさらに含み、前記読取および書込を行なうための第２の手段が前記パスワードを読取りおよび書込むように結合される、請求項１８に記載のＲＦＩＤタグ。

２０．書込ロックビットをさらに含み、前記読取および書込を行なうための第２の手段が前記書込ロックビットを読取りおよび書込むように結合される、請求項１９に記載のＲＦＩＤタグ。

【発明の詳細な説明】

最小電圧無線周波識別

発明の技術分野

この発明は一般的に、無線周波識別（「ＲＦＩＤ」）装置に関し、より特定的には広範囲にわたるＲＦＩＤアクセスに関する。

背景技術

遠隔電子識別装置は典型的に、遠く離れて配置される応答機および質問機ユニットからなる。このような装置の動作範囲は応答機ユニットの基礎をなすアーキテクチャに依存する。ベーグル（Beigel）への米国特許第４，３３３，０７２号では、たとえば、遠隔識別システムはインプラント回路（応答機）にごく近接して動作するプローブ回路（質問機）からなる。インプラント回路はプローブ回路がインプラントに近づけられると電力が供給され、インプラントのコイルにわたる誘導によって電圧を発生する。インプラントからの情報は、インプラントのコイル上の誘導負荷を変化させプローブにおいてそのような変動を検出することによってプローブに転送される。この動作モードでは、プローブをインプラントから非常に近い間隔に置く必要があり、そのためこのような装置の動作範囲を大幅に制限する。

他の遠隔識別システムでは、質問機と応答機との間で通信リンクをもたらすため無線周波信号通信が用いられる。ある階級のこれらの無線周波識別（ＲＦＩＤ）装置では、ＲＦ信号は応答機装置に送信される電力信号を含む。この電力信号は、応答機の電源としての役割を果たす応答機内の電源キャパシタを充電する。応答機からのデータの送信には無線周波数エネルギの発生および送信がかかわる。電源キャパシタはそのような送信のために十分な電力をもたらすのに十分な大きさのものでなければならない。このような応答機では、２メートルのオーダの読取距離が可能となる。しかしながら、このタイプの応答機は、たとえば装置の皮下埋込みによる家畜の識別など、小さいサイズを必要とする応用では実用的では

ない。

第３のカテゴリのＲＦＩＤでは、別のアプローチにより上記の２つの設計からの特徴が組合される。質問機は電力信号を含むＲＦ信号を送信する。受信された電力信号により応答機コイルにわたって誘導される電圧は応答機回路を動作させるのに十分であるが、それ自身の無線信号を発生するには十分ではない。キャパシタをコイルと並列に結合することからタンク回路が形成され、タンク回路のＱはタンク回路にわたっておかれる抵抗または容量性負荷を変化させることによって変えられる。このことからタンク回路のチューニングが変化し、この結果反射された信号において変動が生じ、これを質問機により検出することができる。このように、応答機は、単に抵抗負荷を応じて変調し、質問機が反射された信号における変動を検出できるようにすることによってそのデータを質問機に伝えることができる。

この方式は上記の２つの設計に対して利点を有する。第一に、反射された信号はほぼ１メートルの距離にわたって検出可能である。このため、ベーグルの装置の場合のように質問機が応答機にごく近接して動作する必要はない。第二に、送信された電力信号は応答機にストアされないため、大きな電源キャパシタは必要ではなく、より小型のファクタパッケージが可能となる。

典型的に、ＲＦＩＤは書込可能な不揮発性メモリを含み、装置の電圧レベルがあるレベルに達するまで装置の動作を阻止するパワーオンリセット回路を含む。信頼性のあるデータ送信を保証するために、リセット回路のレベルを不揮発性メモリを動作するための最高レベルに設定することが実施されている。リセット電圧はメモリを動作するのに実際に必要な電圧よりかなり高いため、このことで人工的に読取範囲を制限できる。

改善としては、この第３のカテゴリのＲＦＩＤ装置の動作範囲を増大して電源キャパシタを利用するＲＦＩＤ装置に匹敵する性能をもたらすことである。このため、電源キャパシタを除くことにより可能となる小型パッケージアウトラインをもたらし長距離読取能力を特徴とするＲＦＩＤ装置が必要である。

発明の概要

この発明は、無線周波識別（ＲＦＩＤ）タグを動作させる方法とそうした方法

のための装置とを開示する。方法はＲＦＩＤタグにおける第１の電圧レベルを検出するステップと、そのような検出に応答してタグからデータを送信するステップとを含む。第２の電圧レベルが検出され、このような検出に応答してＲＦＩＤタグのメモリへのある書込動作がイネーブルされる。第３の電圧レベルが検出され、この際にはメモリのある特定の保護領域への書込許可がイネーブルされる。

この発明によるＲＦＩＤタグは、遠隔質問機ユニットにより無線周波（ＲＦ）搬送波上に送信される電力信号を受信するためのタンク回路を含む。ＲＦＩＤタグ内のブリッジ回路は電力信号を整流し、記憶キャパシタを充電する。記憶キャパシタは、不揮発性記憶装置（たとえばＥＥＰＲＯＭ、フラッシュなど）の読取を可能にし、かつ変調回路を動作させてタンク回路にわたって抵抗負荷を変調するのに十分なエネルギ（V_{dd}）を供給する。情報は、メモリから読まれるデータの関数として抵抗負荷を変化させることにより、タグから質問機に伝えられる。そこで、反射された信号における対応する変動が質問機によって検出される。

第１の電圧レベル検出回路は、メモリの読取と変調器の動作を可能にするイネーブル信号をもたらす。第１のレベル検出器は、読取回路および変調回路が切換わるのに十分な電圧があればすぐメモリの読取をイネーブルするように設定される。このことで、データの送信が可能な限り早期に起こることを可能にすることにより、ＲＦＩＤタグの動作範囲を増大する。論理はメモリより低い電圧で動作することもあるため、いくつかの読取動作から破損したデータが生じることもあり得る。しかしながら、データは、電圧が記憶装置の最小動作電圧を超えて上昇し続けるにつれ正確になる。ＲＦＩＤタグにストアされるデータにはエラー検出コードが含まれているため、質問機に到達する欠陥データを検出し無視することができる。

第２の電圧レベル検出回路は、メモリのほとんどの領域への書込動作をイネーブルする。第２のレベル検出器により検出される電圧レベルは第１のレベル検出器により検出される電圧レベルより大きい。質問機により送信される書込むべきデータにはデータとともに書込むべきエラー検出ビットが含まれる。このため、データの正確さがその後のデータの読取の際に確実になる。

メモリは、パスワードおよび書込ロックビットなどの情報を含むある保護された部分を含む。第３の電圧レベル検出回路はメモリの保護領域への書込をイネーブルする。第３のレベル検出器により検出される電圧レベルは第２のレベル検出器により検出される電圧レベルより大きい。好ましい実施例では、第３のレベル検出器により検出される電圧は過電圧保護回路のそれと同じである。このように、メモリへの書込を実行するのに必要な電圧レベル以上の電圧レベルで過電圧回路はトリップするため、メモリの保護領域への書込動作が保証される。

図面の簡単な説明

図１は、この発明によるＲＦＩＤタグのブロック図を示す。

図２は、この発明の低電圧検出回路のブロック図である。

この発明を実施するための最良の形態

図１を参照して、無線周波識別（ＲＦＩＤ）システム１００は質問機ユニット１０２およびトランスデューサユニット（タグ）１０４を含む。質問機１０２はタグ１０４へＲＦ信号を送信するための送信コイル１０３を含む。

タグ１０４はピックアップコイルL_tを含み、これはキャパシタC_tとともにタンク回路１２０を形成する。タンク回路にわたって、電圧クランプ１２２、負荷変調回路１２４および全波ブリッジ整流回路１２６が結合される。電圧クランプ１２２はタンク回路１２０にわたって発達する最大電圧を制限する過電圧保護装置である。このような装置では、コイルL_tにわたる電圧は、特に負荷が低くタンク回路のＱが高い場合に、非常に高いレベルにまで増加することがある。このような高い電圧により装置の故障が生じ得る。コイルにわたる電圧が装置の安全制限に近づくと、クランプ１２２はオンとなりクランプにわたる電流を増加することにより電圧を低減する。

変調回路１２４はタンク回路にわたっておかれる負荷を変化させ、これはタンク回路のＱ値を変化させる。変調回路はコントローラ１３４の制御の下で動作して質問機１０２に伝えるべきデータに従ってタンク回路のＱを変化させる。データは、質問機が反射された信号において対応する変化を検出すると「送信される」。

ブリッジ整流回路１２６は小さいキャパシタC_fを充電して電源電圧V_{dd}をもたらす。電源電圧により不揮発性メモリ１３２に電力が与えられ、これは電圧ポンプを含んでおりプログラミング電圧V_{pp}をもたらす。

クロックジェネレータ１３６はコイルL_tの端子にわたって結合される。クロックジェネレータは実質的には、タグ１０４により受信される信号からクロックを抽出する差動比較器である。

メモリ１３２は２５６ビットＥＥＰＲＯＭであり、８つの３２ビットページからなる。ページ０は２４ビットデータに８つの書込ロックビットを加えたものとして構成される。ページ１－７はユーザページである。書込ロックビットは対応する３２ビットページに書込ができるかどうかを定める。パスワード保護もできる。パスワードはユーザページ７にストアされる。メモリ１３２への読取および書込アクセスはコントローラ１３４を介して提供される。復調器１３８は入来するデータ信号を復調してこれをコントローラ１３４に供給する。データ信号はコマンドビットのシーケンスとその後に続くデータビットの任意のシーケンスとを含む。

低電圧検出回路１３０はイネーブル信号１３１をもたらし、装置がパワーアップするにつれてさまざまな電圧レベルにおいてある特定の動作をイネーブルする。図２には、この発明による低電圧ブロック１３０のブロック図が示される。電圧基準は、抵抗器Ｒ１－Ｒ３からなる「抵抗器チェーン」にわたって降下する。図２の概略的な図では、説明を明らかにするため抵抗器を用いた回路が示される。しかしながら、「抵抗器チェーン」が直列接続のＮチャネルトランジスタを含む一般的に用いられる回路からなることが理解される。抵抗器チェーンは、一連の比較器１３３Ａ－１３３Ｃに供給するマルチノード分圧器としての役割を果たす。

電圧基準回路は典型的には１．２Ｖであるバイポーラトランジスタのバンドギャップ電圧の値に設定され、電源電圧、温度およびプロセス変動とは無関係である電圧基準をもたらす。このような回路は当該技術においては周知であり理解されており、数多くの公知の設計のうちのいずれを用いてもよい。Ｒ４およびＲ５を含む第２の抵抗器チェーンは電源電圧V_{dd}を分割する。

各比較器は分割された電源電圧を抵抗器チェーンにおける各ノードＡ－Ｃにおける電圧と比較する。そこで、分割されたV_{dd}がV_Aに達すると第１のイネーブル信号１３１Ａがもたらされ、V_Aは抵抗器Ｒ１にわたる電圧降下であり、これは以下の分圧器の等式から計算される。

$$V_A = V_{ref}\left(\frac{R_1}{R_1 + R_2 + R_3}\right) \qquad \text{式1}$$

同様に、第２のイネーブル信号１３１Ｂは分割されたV_{dd}がV_Bに達するともたらされ、V_Bは以下のように定義される。

$$V_B = V_{ref}\left(\frac{R_1 + R_2}{R_1 + R_2 + R_3}\right) \qquad \text{式2}$$

最後に、単純に電圧基準そのものである、ノードＣにおける電圧に基づいて第３のイネーブル信号１３１Ｃが生じる。すなわち、分割されたV_{dd}がV_{ref}に達すると信号１３１Ｃがアサートされる。

図１を再び参照して、低電圧検出器１３０はこれらのイネーブル信号をコントローラ１３４に供給する。第１のイネーブル信号１３１Ａがアサートされると、コントローラはメモリ１３２の内容を読出し始め、タンク回路１２０の負荷を変調することによりデータを「送信し」始める。抵抗器Ｒ１はこれにわたる電圧降下V_Aが、コントローラ１３４を構成するトランジスタがちょうど切換えられ始めるようなものであるように選択される。このように、質問器１０２による読取動作は応答機１０４から可能な限り遠い距離において開始することができ、これによって応答機の動作範囲が効果的に広がる。

低電圧検出器１３０の第２のイネーブル信号１３１Ｂはコントローラ１３４をイネーブルしてメモリ１３２の保護対策のなされていない領域への書込動作を可能にする。これにはユーザページ１－６が含まれ、パスワード保護が用いられていない場合ではページ７も含まれる。ページ０（およびパスワード保護が用いられている場合はページ７）への書込アクセスは許可されない。

低電圧検出器１３０の第３のイネーブル信号１３１Ｃはコントローラ１３４をイネーブルしてメモリ１３２の保護領域への読取および書込動作を可能にする。上述のように、ページ０は、各々の対応する８つの３２ビットページの書込アク

セスを定める書込ロックビットを含む。一旦ページがロックされるとこれに書込むことはできない。このようなページがアンロックされることを永久的に防ぐためにさらなるセキュリティが提供される。このため、ロックビットの書込が正確であるのを確実にすることが重要である。このことは、第３のイネーブル信号に対応する電圧レベルを過電圧保護回路１２２の電圧レベルに設定することにより達成される。そうすることにより、メモリ１３２の電圧ポンプは可能な限り高いプログラミング電圧を生成するために利用可能な最大安全電圧を有することが保証される。このことにより、ロックビットの信頼性のある書込が容易となり、そのため、装置を役に立たないものにしてしまうことがある、ページの誤ったロックアウトが起こる可能性を最小にする。

メモリの保護されていない領域の読取はコントローラ１３４が動作し始めるとすぐに始まることを思い起こされたい。このような低電圧の状態では、メモリを誤って読取り、かつ／または質問機にデータを送信する上でエラーを経験し、その結果、質問機が誤って伝わったデータを受信することにつながる可能性がある。この発明によれば、メモリ１３２にストアされるデータはエラー検出ビットを含む。エラービットは質問機１０２により計算されデータとともに応答機１０４にストアされる。そのため、質問機により受信された破損したデータは、受信されたデータのエラービットを計算してこれを受信されたエラービットと比較することにより検出することができる。さらに、この発明によれば、コントローラは連続してデータを再送信するため、（質問機が極端な動作範囲にあることにより）低電圧の状態が長引いても、その後の再送信から正しいデータが生じる確率が高い。

【図１】

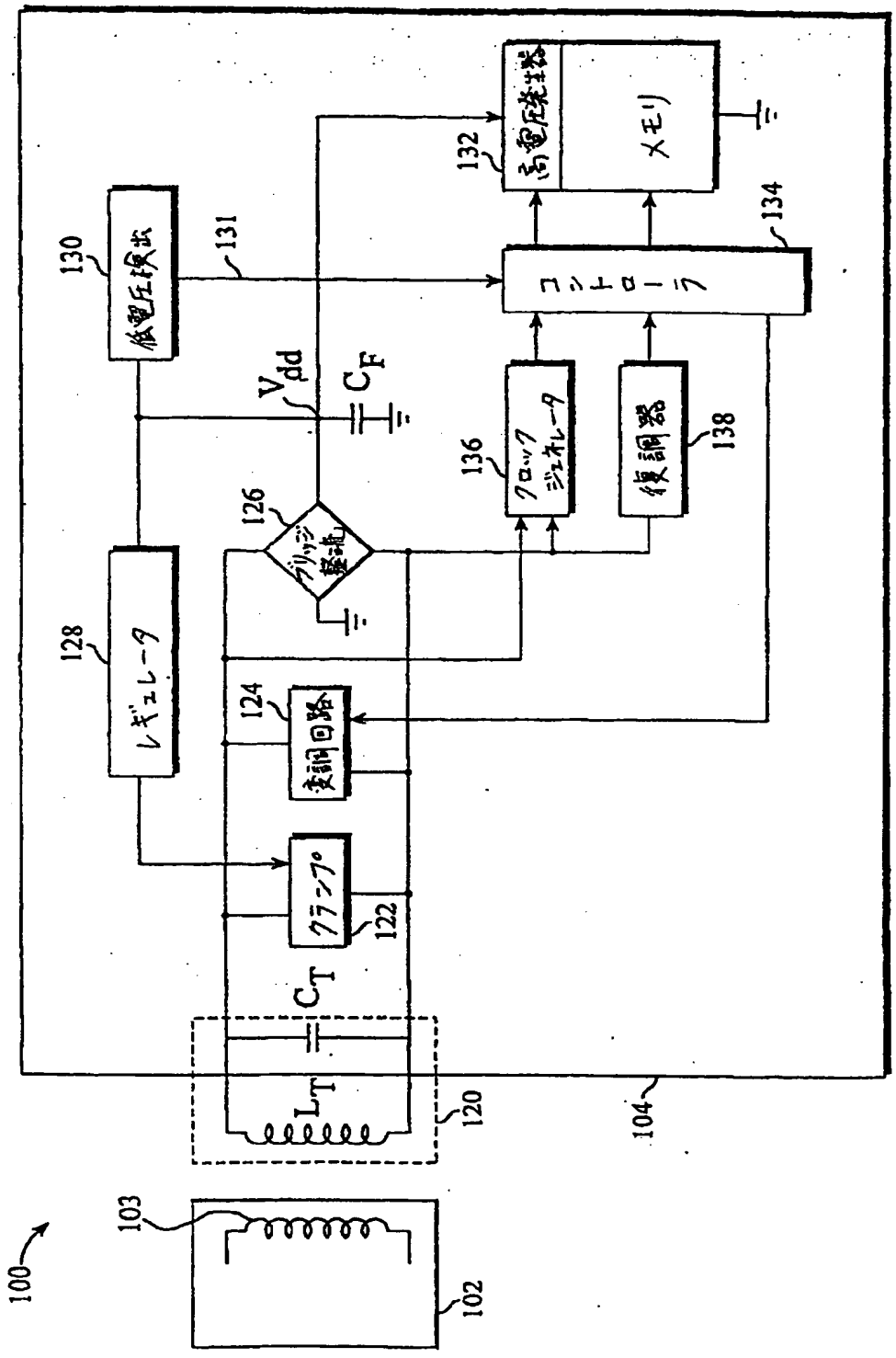
100
102
103
104
120
122
124
126
128
130
131
132
134
136
138
L_T
C_T
V_{dd}
C_F
低電圧検出
レギュレータ
クランプ
復調回路
ブリッジ整流
クロックジェネレータ
復調器
コントローラ
高電圧発生器
メモリ

Fig. 1

【図２】

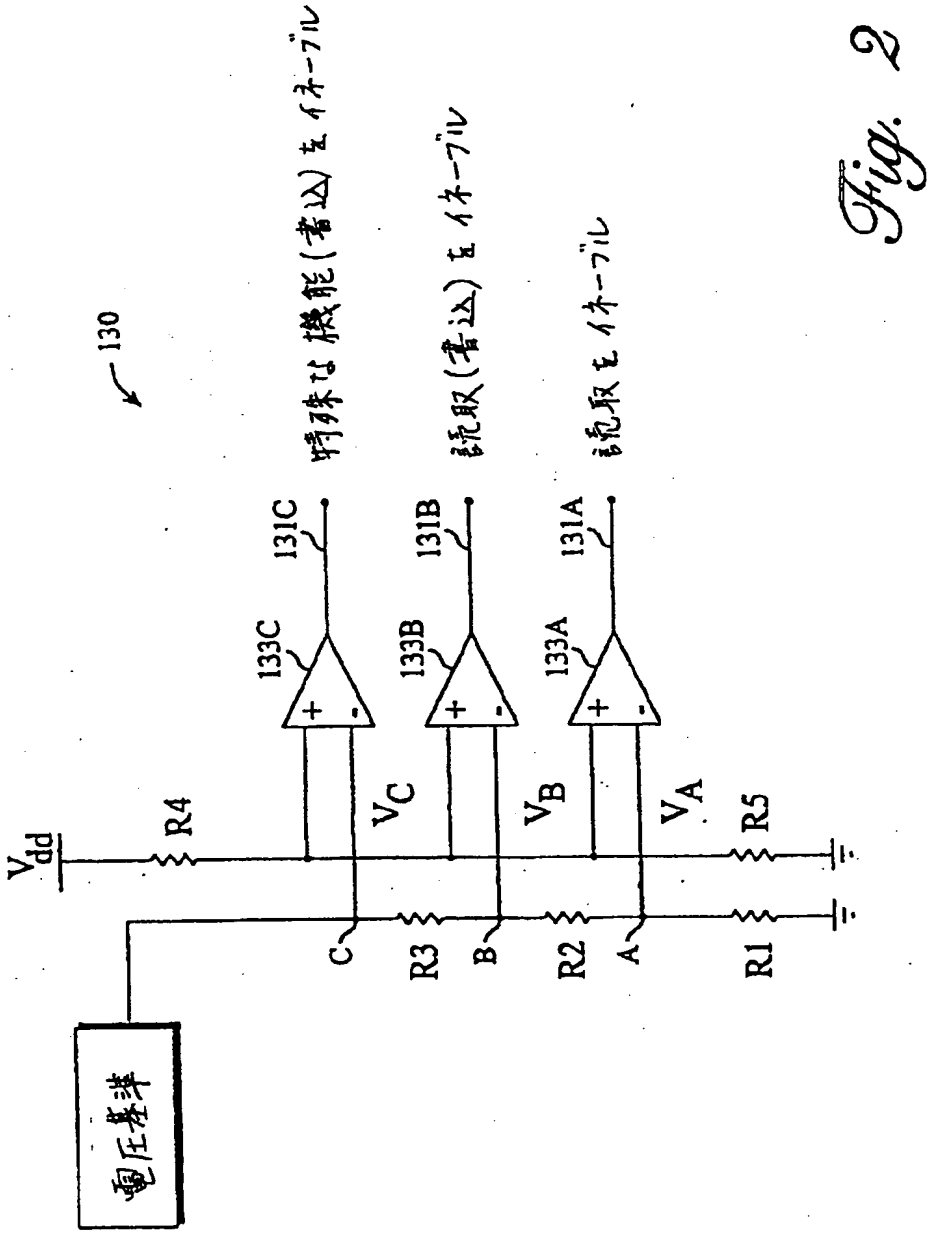
130
特殊な機能(書込)をイネーブル
読取(書込)をイネーブル
読取をイネーブル
131C
131B
131A
133C
133B
133A
+
-
V_{dd}
R4
V_C
V_B
V_A
R5
C
B
A
R3
R2
R1
電圧基準

Fig. 2

【手続補正書】特許法第１８４条の４第４項
【提出日】平成１１年４月７日（１９９９．４．７）
【補正内容】

請求の範囲

１．信号を送受信するためのタンク回路（１２０）を有する無線周波識別（ＲＦＩＤ）タグ１００を動作させる方法であって、前記ＲＦＩＤタグはさらにメモリ（１３２）を有し、前記方法は、

電力信号を前記ＲＦＩＤタグに送信して、それによって前記タンク回路において電圧を誘導するステップと、

第１の電源電圧レベルを検出するステップとを含み、前記第１の電源電圧レベルは前記ＲＦＩＤタグにおける少なくとも１つのトランジスタがちょうど切換えられ始める際のものであり、前記方法はさらに

前記第１の電源電圧レベルの検出に応答して、効果的にデータを送信するために前記タンク回路のＱ値を、前記ＲＦＩＤタグにストアされるデータを表わす態様で変調するステップと、

前記第１の電源電圧レベルより大きい第２の電源電圧レベルを検出するステップと、

前記第２の電源電圧レベルの検出に応答して、前記メモリの第１の部分への書込動作をイネーブルするステップとを含む、方法。

２．前記電力信号を整流してキャパシタを充電することによって前記電源電圧を発生するステップをさらに含む、請求項１に記載の方法。

３．前記メモリにストアするためのデータを受信するステップをさらに含み、前記データはエラー検出ビットを含む、請求項１に記載の方法。

４．前記データを効果的に再送信するために前記Ｑ値を変調する前記ステップを繰返すステップをさらに含む、請求項１に記載の方法。

５．第３の電源電圧レベルを検出するステップと、前記メモリの第２の部分の読取および書込をイネーブルするステップとをさらに含む、請求項１に記載の方法。

６．前記第３の電源電圧レベルを検出した際に前記ＲＦＩＤタグにストアされる

パスワードの読取および書込をイネーブルするステップをさらに含む、請求項５に記載の方法。
７．前記第３の電源電圧レベルを検出した際に書込ロックビットの読取および書込をイネーブルするステップをさらに含む、請求項６に記載の方法。

８．無線周波識別（ＲＦＩＤ）タグを動作させる方法であって、

前記ＲＦＩＤタグに送信される無線周波数搬送波上の電力信号を受信するステップと、
受信した電力信号から供給電圧を生成するステップと、
前記供給電圧が第１の電圧レベルに達するとこれを検出するステップとを含み、前記第１の電圧レベルは前記ＲＦＩＤタグ内の少なくとも１つのトランジスタがちようど切換えられ始める際のものであり、前記方法はさらに
前記第１の電圧レベルの検出に応答して第１のメモリ読取動作をイネーブルするステップと、
読まれたデータを送信するステップと、
前記供給電圧が前記第１の電圧レベルより大きい第２の電圧レベルに達するとこれを検出し、これに応答してメモリ書込動作をイネーブルするステップと、
前記供給電圧が前記第２の電圧レベルより大きい第３の電圧レベルに達するとこれを検出して、これに応答して第２のメモリ読取動作をイネーブルして前記ＲＦＩＤタグにストアされるパスワードを読むステップとを含む、方法。
９．前記第３の電圧レベルの検出に応答してメモリ書込動作をイネーブルして前記パスワードに書込むステップをさらに含む、請求項８に記載の方法。
１０．前記送信するステップは、タンク回路の負荷抵抗器を変調するステップを含む、請求項８に記載の方法。
１１．読まれたデータを再送信するために前記負荷抵抗器を変調する前記ステップを繰返すステップをさらに含む、請求項１０に記載の方法。
１２．供給電圧を生成する前記ステップは、受信した電力信号を整流し、キャパシタを充電するステップを含む、請求項１１に記載の方法。
１３．保護されたメモリ領域と保護されないメモリ領域とを設け、前記保護され

たメモリ領域にパスワードをストアするステップをさらに含み、前記第１のメモリ読取動作が前記保護されていないメモリ領域に向けられ、前記第２のメモリ読取動作が前記保護されたメモリ領域に向けられる、請求項８に記載の方法。

１４．前記第３の電圧レベルの検出に応答して前記保護されたメモリ領域に向けられるメモリ書込動作をイネーブルするステップと、前記保護されたメモリ領域に書込ロックビットをストアするステップとをさらに含む、請求項１３に記載の方法。

１５．無線周波数識別（ＲＦＩＤ）タグであって、

第１のイネーブル信号をもたらすための第１のイネーブル手段（１３３Ａ）と、

第２のイネーブル信号をもたらすための第２のイネーブル手段（１３３Ｂ）と、

負荷を含むタンク回路（１２０）と、

前記タンク回路のＱ値を変化させるように前記負荷を変調するための手段（１２４）と、

中に含まれるデータを読取るための手段（１３４）と中へデータを書込むための手段（１３４）とを有するメモリアレイ（１３２）とを含み、

読取るための前記手段は、前記メモリアレイから読まれるデータに応答して、前記タンク回路の前記Ｑ値を変化させるように変調するための前記手段に結合され、

読取るための前記手段は前記第１のイネーブル手段に結合され、かつこれによりイネーブルされ、

書込むための前記手段は前記第２のイネーブル手段に結合され、かつこれによりイネーブルされる、ＲＦＩＤタグ。

１６．供給電圧を生成するための手段をさらに含み、前記第１のイネーブル信号は供給電圧が第１の電圧レベルに達したことを示し、前記第２のイネーブル信号は前記供給電圧が前記第１の電圧レベルよりも大きい第２の電圧レベルに達したことを示す、請求項１５に記載のＲＦＩＤタグ。

１７．入力過電圧保護装置をさらに含み、前記保護装置は前記ＲＦＩＤタグが前記第２の電圧レベルに達するとトリガされ、前記保護装置は書込むための前記手段をイネーブルするように結合される、請求項１６に記載のＲＦＩＤタグ。
１８．第３のイネーブル信号をもたらすための第３のイネーブル手段と、前記第３のイネーブル手段によりイネーブルされる記憶装置に対して読取および書込を行なうための第２の手段とをさらに含む、請求項１５に記載のＲＦＩＤタグ。
１９．パスワードをさらに含み、前記読取および書込を行なうための第２の手段が前記パスワードを読取りおよび書込むように結合される、請求項１８に記載のＲＦＩＤタグ。
２０．書込ロックビットをさらに含み、前記読取および書込を行なうための第２の手段が前記書込ロックビットを読取りおよび書込むように結合される、請求項１９に記載のＲＦＩＤタグ。

【国際調査報告】

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US98/25774

A. CLASSIFICATION OF SUBJECT MATTER
IPC(6) :H02H 9/00
US CL :340/825.54, 825.34, 825.63, 572; 361/56
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
U.S. : 340/825.54, 825.34, 825.63, 572; 361/56

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
APS MESSENGER
search terms : radio frequency, identif? tag, tank circuit, transceiver, detect?, power signal, error detection bit, enabl?

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X,P	US 5,815,355 A (DAWES) 29 September 1998, see entire document	1-20

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
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Date of the actual completion of the international search	Date of mailing of the international search report
14 JANUARY 1999	29 MAR 1999
Name and mailing address of the ISA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231 Facsimile No. (703) 305-3230	Authorized officer YVES DALENCOURT Telephone No. (703) 308-8547

Form PCT/ISA/210 (second sheet)(July 1992) *